The claims defining the invention are as follows:

1. A system for driving a direct-current (DC) motor under conditions of a controlled average current, said system comprising:

an inductive element for connection in series with said DC motor;

a first switch coupled to said inductive element for connecting and disconnecting a terminal of said inductive element remote from said DC motor to a voltage source;

a second switch connected in parallel with a combination of said inductive element and said DC motor arranged in series, controlled so that a current circulating through said inductive element circulates through said second switch if the first switch disconnects said terminal of said inductive element from said voltage source;

a capacitor arranged for connection in parallel with said DC motor to limit a resulting voltage over said DC motor;

means for measuring a current through said DC motor; and

means for controlling operation of said first and second switches dependent upon said measured current in said DC motor.

2. The system according to claim 1, wherein said voltage source is larger than the nominal operating voltage of said DC motor.

3. A system for driving a direct-current (DC) motor under conditions of controlled average current, said system comprising:

a capacitor arranged for connection in parallel with said motor to limit a resulting voltage over said motor, the other terminal of the parallel combination of said capacitor and said motor connected to a common terminal;

an inductive element connected to the common terminal;

a first switch coupled to said inductive element for connecting and disconnecting a terminal of said inductive element to a voltage source;

a second switch connected in series with the parallel combination of said motor and said capacitor, and connected to the common node between the first switch and said inductive element, controlled so that the current circulating through said inductive element circulates through said second switch if the first switch disconnects said terminal from said voltage source;

means for measuring a current through the motor; and

means for controlling operation of said first and second switches dependent upon said measured current in the motor.

4. A system for driving a direct-current (DC) motor under conditions of a controlled average current, said system comprising:

a capacitor arranged for connection in parallel with said motor to limit a resulting voltage over said motor, a terminal of said capacitor and said motor being connected to a DC voltage source;

an inductive element connected to a common node of said DC voltage source, said capacitor and said motor;

a first switch coupled to said inductive element for connecting and disconnecting a terminal of said inductive element to the terminal of said voltage source not connected to the parallel combination of said capacitor and said motor;

a second switch connected in series with the parallel combination of said motor and said capacitor and connected to the common node between the first switch and said inductive element, controlled so that the current circulating through said inductive element circulates through said second switch if the first switch disconnects said terminal from said voltage source;

means for measuring a current through the motor; and

means for controlling operation of said first and second switches dependent upon said measured current in the motor.

5. The system according to claim 1, 2, 3 or 4, wherein said second switch is a diode connected with appropriate polarity so that current circulating through said inductive element circulates through said diode if said first switch disconnects said terminal from said voltage source.

6. The system according to claim 1, 2, 3 or 4, wherein said second switch is an electronic switch for synchronous rectification connected with appropriate polarity so that current circulating through said inductive element circulates through said electronic switch if said first switch disconnects said terminal from said voltage source.

7. The system according to any one of claims 1 to 6, wherein said first switch is an electronic switch.

8. A system for driving a direct-current (DC) motor under conditions of a controlled average current, a voltage of a DC power supply having a larger or smaller value than a motor nominal voltage, said system comprising:

an inductive element for connection in series with the DC motor;

an arrangement including a plurality of switches, diodes and a magnetic system, said arrangement coupled to said inductive element for connecting and disconnecting a terminal of said inductive element remote from said motor to a voltage source, said arrangement configured as circuit selected from the group consisting of:

- a forward DC-DC converter
- a push-pull DC-DC converter
- a half-bridge DC-DC converter
- a diagonal-half bridge DC-DC converter
- a full bridge DC-DC converter

a capacitor arranged for connection in parallel with said motor to limit a resulting voltage over the motor;

means for measuring a current through the motor; and

means for controlling operation of said arrangement dependent upon said measured current in the motor.

9. The system according to any one of claims 1 to 8, wherein said inductive element is an inductor, or a winding of a transformer.

10. The system according to any one of claims 1 to 9, wherein a current through the inductive element can be controlled independently from a current through the motor, the balance of electrical charge being accumulated or taken from the capacitor in parallel with the motor.

11. The system according to any one of claims 1-10, wherein a current through the inductive element is modulated as a full wave rectified sinusoid synchronous with the AC main voltage so that the power factor of the system, as a load to the AC main is improved.

12. A system for driving a direct-current (DC) motor under conditions of a controlled average current, a voltage of a DC power supply having a larger or smaller value than a motor nominal voltage, said system comprising:

a diode;

a magnetic transformer connected in series with said diode in a circuit arrangement selected from the group consisting of a flyback DC-DC converter and a ringing choke DC-DC converter, said transformer and said diode for connection in series with the DC motor;

a switch coupled to said magnetic transformer and said diode for connecting and disconnecting a terminal of said magnetic transformer and said diode remote from said motor to a voltage source;

a capacitor arranged for connection in parallel with said motor to limit a resulting voltage over the motor;

means for measuring a current through the motor; and

means for controlling operation of said switch dependent upon said measured current in the motor.

13. The system according to claim 12, wherein said switch is an electronic switch.

14. A system for driving a direct-current (DC) motor under conditions of a controlled average current, a voltage of a DC power supply having a larger or smaller value than a motor nominal voltage, said system comprising:

an electronic synchronous rectification switch;

a magnetic transformer connected in series with said synchronous rectification switch in a circuit arrangement selected from the group consisting of a flyback DC-DC converter and a ringing choke DC-DC converter, said transformer and said synchronous rectification switch for connection in series with the DC motor;

a switch coupled to said magnetic transformer and said synchronous rectification switch for connecting and disconnecting a terminal of said magnetic transformer and said synchronous rectification switch remote from said motor to a voltage source;

a capacitor arranged for connection in parallel with said motor to limit a resulting voltage over the motor;

means for measuring a current through the motor; and

means for controlling operation of said switch dependent upon said measured current in the motor.

15. The system according to claim 14, wherein said switch is an electronic switch.

16. The system according to any one of claims 12-15, wherein a current through the flyback inductance can be controlled independently from a current through the motor, the balance of electrical charge being accumulated or taken from the capacitor in parallel with the motor.

17. The system according to any one of claims 12-16, wherein a current through the flyback inductance is modulated as a full wave rectified sinusoid synchronous with the AC main voltage so that the power factor of the system, as a load to the AC main is improved.

18. The system according to any one of claims 1 to 17, further comprising a DC motor.

19. The system according to claim 18, wherein said DC motor includes a brush-less DC motor.

20. The system according to claim 19, wherein said DC motor includes an electronic commutator for said brush-less DC motor.

21. The system according to any one of claims 1-20, wherein said means for measuring said current through the motor includes means for calculating said current though the motor dependent upon current measured in another part of said system.

22. The system according to any one of claims 1-21, wherein a frequency of a pulse width modulated waveform, resulting from operation of said switches, is randomised to facilitate EMI compliance.

23. An airflow apparatus, comprising:

a brush-less DC motor;

an electronic circuit for controlling operation of said brush-less DC motor;

a power supply for said electronic circuit separate from a power supply for said brush-less DC motor, said power supply for said electronic circuit adapted to use a voltage resulting from said brush-less DC motor in operation once said resulting voltage reaches a suitable value; and

means for reducing power to said electronic circuit from said power supply once said resulting voltages reaches said suitable value.

24. The airflow apparatus according to claim 23, wherein said apparatus is an airflow generator.

25. The airflow apparatus according to claim 24, wherein said airflow generator is for use in medical applications.

26. The airflow apparatus according to any one of claims 23-25, wherein said reducing means comprises means for disconnecting said electronic circuit from said power supply for said control electronics.

27. The airflow apparatus according to any one of claims 23-26, wherein said electronic circuit comprises an electronic commutator or driving electronics for said brush-less DC motor.

28. The airflow apparatus according to any one of claims 23-27, wherein said electronic circuit comprises a buck converter or down converter switched mode power supply connected to a rectified AC main voltage.

29. The airflow apparatus according to any one of claims 23-28, wherein said electronic circuit comprises means for controlling current through said brush-less DC motor.

30. The airflow apparatus according to any one of claims 23-29, wherein said electronic circuit utilizes a pulse width modulated square wave applied through a transformer to control a voltage over said motor.

31. The airflow apparatus according to claim 30, wherein said transformer is part of a forward converter, a push-pull converter, a half bridge converter, a diagonal half bridge converter, a bridge converter, or a flyback converter.

32. The airflow apparatus according to claim 23, further comprising a driving system according to any one of claims 1-11, wherein said electronic circuit controls a current through said brush-less DC motor (BLDCM), where said inductive element is a winding of a transformer having a plurality of secondary windings, a secondary winding being used to provide power to said electronic circuit.

33. The airflow apparatus according to any one of claims 23, 26, 27, 28, 29, 30, 31, and 32 wherein said airflow generator is for use as a cooling fan or a ventilation fan.

34. The air flow apparatus according to claim 33 wherein a plurality of brushless DC motor driven ventilation fans or cooling fans are connected in series between each other.

35. A system for powering a microprocessor based system from a DC voltage higher than the voltage required by the system to operate, comprising:

a capacitor;

means to charge said capacitor from the DC voltage with a current substantially smaller than the current the microprocessor based system needs to operate;

a switch coupled to said capacitor so that said switch can connect power to the microprocessor based system from the charge accumulated in the capacitor;

means for sensing the voltage in the capacitor and causing the switch to close once the voltage in said capacitor reaches a desired value; and

means for keeping the switch closed while the voltage in said capacitor is over a desired value, but less than the value that caused said sensing means to close the switch.

36. The system according to claims 35, wherein said switch is an electronic switch.

37. The system according to claims 35 or 36, further comprising means for limiting current through said switch.

38. The system according to claims 10 or 16 wherein the current through the motor is calculated from the variation of the voltage across the capacitor in parallel with the motor.

39. The system according to claim 11 or 17, wherein the instant in which the sinusoidal waveform of the AC main crosses zero is sensed to synchronise the modulation performed to the current through the inductive element with the waveform in the AC main.

40. The system according to any one of claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 14 and 15, wherein the voltage over the DC motor is used to estimate the speed of the motor.

41. A switching based alternating current (AC) to direct current (DC) converter, comprising:

a rectifier adapted to be connected to an alternating current (AC) mains line;

a first capacitor for noise reduction connected in parallel with an output of said rectifier;

an inductive element connected to a terminal of said rectifier and said first capacitor;

a first switch coupled to said inductive element for connecting and disconnecting a terminal of said inductive element remote from said parallel combination of said rectifier output and said first capacitor;

a second switch connected to the connection node between said inductive element and said first switch, controlled so that the current circulating through said inductive element circulates through said second switch when the first switch disconnects said inductive element from said parallel combination of said rectifier output and said first capacitor;

a second capacitor for energy storage connected to the terminal of said second switch remote from said inductive element, said second capacitor is connected in parallel with the serial combination of said second switch and said inductive element, the direct current (DC) output of said alternating current (AC) to direct current (DC) converter being taken from the terminals of said second capacitor;

means for sensing a current through the inductive element;

means for sensing the voltage across said first capacitor;

means for sensing the voltage across said second capacitor; and

a control circuit connected to said first switch to maintain the voltage across said second capacitor between defined limits by operating said first switch in a way that a current through said inductive element tracks the waveform of the alternating current line voltage to cause said AC to DC converter to exhibit unity power factor to the alternating current line.

42. The converter defined in claim 41, wherein said second switch is a diode.

43. The converter defined in claims 41 or 42, wherein said first switch comprises a field effect transistor.

44. The converter defined in claim 41, 42, or 43, wherein said rectifier comprises a full-wave diode rectifier.

45. The converter defined in claim 41, 42, 43 or 44, wherein said inductive element is an inductor, or a winding of a transformer.

46. The converter defined in claim 41, 42, 43 or 45, wherein a frequency of a pulse width modulated waveform controlling said first switch or said second switch, resulting from operation of said switches, is randomised to facilitate EMI compliance.